

## PATENT ABSTRACTS OF JAPAN

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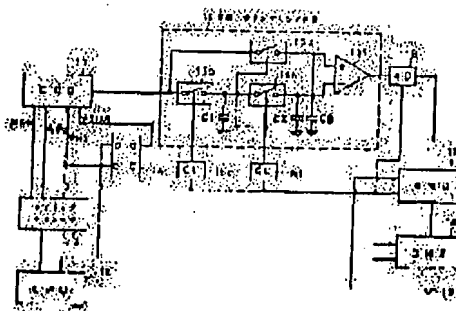
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## (54) IMAGE PICKUP DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To speedily operate series of the operation of a solid state image pickup element line sensor without the influence of the operation of an electronic shutter to a picture signal by executing the operation of the electronic shutter in the resetting period of an image pickup signal in the middle of the transfer of an electric charge.

**SOLUTION:** A shutter pulse  $\phi$ SHUT generated at a central controller 12 is supplied to the terminal D of a D-type FF circuit 14 and a reset pulse  $\phi$ RS from a timing generator 13 is supplied to the clock terminal C of the circuit 14.  $\phi$ SHUT obtained at the terminal Q of the circuit 14 is supplied  $\phi$ SHUT synchronized with the rising of  $\phi$ RS, namely synchronized with the rising of the resetting period of the image pickup signal obtained at the output side of a CCD line sensor 11 for the sensor 11. In this case, even when the image pickup signal is fluctuated, this fluctuation is equal in a field through period and a signal period. An image pickup signal obtained at the output side of the sensor 11 is supplied for a correlated double sampling circuit 15 for double sampling so as to remove the fluctuation of the image pickup signal.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the image pick-up equipment which used it for the image reader and used the suitable solid state image sensor line sensor.

[0002]

[Description of the Prior Art] Conventionally, the \*\*\*\* CCD line sensor which has electronic shutter ability and which is shown in drawing 4 is proposed as image pick-up equipment of an image reader.

[0003] In this drawing 4, the sensor section in which, as for 1, a longitudinal direction comes to arrange 2700 sensors at a single tier, and 2 show the shift register which consists of CCD formed corresponding to this sensor section 1, and 3 is the diffusion amplifier formed in the outgoing end of this shift register 2.

[0004] While forming the lead-out gate 4 between this sensor section 1 and shift register 2, the shift register 2 of the sensor section 1 forms the shutter drain 5 in the opposite side, and forms the shutter gate 6 between this sensor section 1 and this shutter drain 5.

[0005] In the \*\*\*\* CCD line sensor shown in \*\*\*\* drawing 4, the \*\*\*\* shift pulses phi1 and phi2 which supply \*\*\*\* lead-out gate pulse phiROG shown in drawing 5 A to the lead-out gate 4, and carry out as [ read / to a shift register 2 / the signal charge of the sensor section 1 ], and are shown in this shift register 2 at drawing 5 B and C are supplied, and it carries out as [ transmit / to an output side / this signal charge ].

[0006] Moreover, \*\*\*\* reset pulse phiRS shown in the diffusion amplifier 3 formed in the outgoing end of this shift register 2 at drawing 5 D is supplied, and it carries out as [ reset / for every reset pulse phiRS of this / this diffusion amplifier 3 ].

[0007] Moreover, \*\*\*\* shutter pulse phiSHUT shown in drawing 5 E is supplied to the shutter gate 6, when this shutter pulse phiSHUT is high level "1", it carries out as [ throw / turn on this shutter gate 6 and / into the shutter drain 5 / the charge of the sensor section 1 ], and when this shutter pulse phiSHUT is a low level "0", a charge is accumulated in this sensor section 1, and be made to let this be a signal charge.

[0008] The image pick-up signal 7 which the signal which changes from \*\*\*\* and reset period 7a which are shown in drawing 5 G, field through period 7b which is reference level, and signal period 7c to the output side of the diffusion amplifier 3 of the outgoing end of the shift register 2 which is the outgoing end of a \*\*\*\* CCD line sensor repeats a predetermined period is acquired.

[0009]

[Problem(s) to be Solved by the Invention] In the \*\*\*\* CCD line sensor shown in \*\*\*\* and

drawing 4 , since it changed though the power source and touch-down potential which are supplied to this CCD line sensor were feeble when shutter pulse phiSHUT was made into a low level "0" from high level "1", it was not performing making this shutter pulse phiSHUT into a low level "0" for a signal charge from high level "1" during a transfer with a shift register 2, and making the sensor section 1 into the storage time.

[0010] Therefore, as shown in this CCD line sensor carrying out a series of actuation conventionally at drawing 5 E and F, beyond the time amount adding the charge transfer time of a shift register 2, for example, the 2700 count period of a shift pulse phi 1, and electronic shutter time amount, i.e., the storage time of a signal charge, for example, the 1350 - 2700 count time amount of a shift pulse phi 1, was needed, and there was un-arranging [ to which this operating time of a series of becomes comparatively long ].

[0011] This invention aims at the ability to be made to carry out high-speed operation of a series of actuation of solid state image sensor line sensors, such as this CCD line sensor, without electronic shutter actuation influencing a picture signal in view of \*\*\*\*\*.

[0012]

[Means for Solving the Problem] This invention image pick-up equipment is made to perform electronic-shutter actuation during a charge transfer of this solid state image sensor line sensor synchronizing with the reset period of this image pick-up signal in the image pick-up equipment which has the solid state image sensor line sensor with which the image pick-up signal which the signal which consists of a reset period, the field through period which is reference level, and a signal period repeats a predetermined period is acquired, and the correlation duplex sampling circuit to which the image pick-up signal from this solid state image sensor line sensor is supplied.

[0013] In this invention, since it was made to perform electronic shutter actuation during the charge transfer of a solid state image sensor line sensor, it is short and a series of operating times of this solid state image sensor line sensor can be accelerated.

[0014] Moreover, since this fluctuation is removed by the field through period and signal period of an image pick-up signal having the same fluctuation, and carrying out the correlation duplex sampling of this electronic shutter actuation after that, even if the signal charge under charge transfer has fluctuation by this electronic shutter actuation, since it synchronizes with the reset period of an image pick-up signal according to this invention, a good picture signal without the effect of electronic shutter actuation can be outputted.

[0015]

[Embodiment of the Invention] Hereafter, with reference to a drawing, I will explain per example of this invention image pick-up equipment. In drawing 1 , 11 shows the \*\*\*\* CCD line sensor shown in drawing 4 . Moreover, 12 shows the central control unit which controls the image pick-up equipment twisted to this example, and supplies the start pulse from this central control unit 12 to a timing generator 13.

[0016] This timing generator 13 is carried out as [ supply / to the CCD line sensor 11 / lead-out gate pulse phiROG, the shift pulses phi1 and phi2, and reset pulse phiRS which generated \*\*\*\* shown in drawing 5 A, B, C, and D which synchronized with the start pulse from this central control unit 12, lead-out gate pulse phiROG, shift pulses phi1 and phi2, and reset pulse phiRS and were generated in this timing generator 13 ].

[0017] The image pick-up signal 7 which the signal which changes from reset period 7a by \*\*\*\* and reset pulse phiRS which are shown in drawing 5 G, field through period 7b which is reference level, and signal period 7c to the output side of the \*\*\*\* CCD line sensor 11 repeats a predetermined period is acquired.

[0018] In this example, while it changes to the charge storage time from the time of throwing away the charge for the signal charge into the transfer time T with the shift register 2 with the central control unit 12 at the shutter drain 5, i.e., supplying shutter pulse  $\phi$ SHUT which generated \*\*\*\* shutter pulse  $\phi$ SHUT used as electronic shutter actuation, and was generated with this central control unit 12 to D terminal of the D form flip-flop circuit 14, reset pulse  $\phi$ IRS from a timing generator 13 is supplied to the clock terminal C of this D form flip-flop circuit 14.

[0019] As shown in drawing 2 D obtained by Q terminal of this D form flip-flop circuit 14, it carries out as [ supply / to the CCD line sensor 11 / shutter pulse  $\phi$ SHUT which synchronized with the standup of reset period 7a of the image pick-up signal 7 acquired by the output side of the \*\*\*\* CCD line sensor 11 which synchronized with the standup of \*\*\*\* reset pulse  $\phi$ IRS shown in drawing 2 B, namely, is shown in drawing 2 C ].

[0020] In this case, since shutter pulse  $\phi$ SHUT is changing synchronizing with reset period 7a of the image pick-up signal 7, even if only  $\Delta V$  has fluctuation in this image pick-up signal 7, similarly this fluctuation  $\Delta V$  will be changed by field through period 7b and signal period 7c which are reference level.

[0021] The \*\*\*\* image pick-up signal 7 shown in drawing 2 C obtained by the output side of this CCD line sensor 11 is supplied to the correlation duplex sampling circuit 15. That is, the output terminal of this CCD line sensor 11 is connected to connection switch 15a which becomes ON at field through period 7b which is the reference level of the image pick-up signal 7 which constitutes the correlation duplex sampling circuit 15, and signal period 7c of this image pick-up signal 7 through sampling switch 15b used as ON at inversed input terminal - of operation amplifying-circuit 15c.

[0022] It is the capacitor C1 for a reference voltage hold about the node of this connection switch 15a and sampling switch 15b. While minding and grounding, it is the inversed input terminal of operation amplifying-circuit 15c. - Capacitor C2 for a reference voltage hold It minds and grounds.

[0023] Moreover, while connecting the output terminal of the CCD line sensor 11 to non-inversed input terminal + of operation amplifying-circuit 15c through sampling switch 15d which is interlocked with sampling switch 15b at signal period 7c of the image pick-up signal 7 which constitutes the correlation duplex sampling circuit 15, and becomes ON, it is the capacitor C3 for a signal-level hold about this non-inversed input terminal +. It minds and grounds.

[0024] In this example, the \*\*\*\* shift pulse  $\phi$ 1 shown in drawing 2 A obtained by the output side of a timing generator 13 is supplied to delay circuit 15e, while forming the switch signal which turns on connection switch 15a in field through period 7b of the image pick-up signal 7, this shift pulse  $\phi$ 1 is supplied to 15f of delay circuits, and the switch signal which turns on sampling switches 15b and 15d in signal period 7c of the image pick-up signal 7 is formed.

[0025] As shown at drawing 2 E in the output side of this correlation duplex sampling circuit 15, i.e., the output side of operation amplifying-circuit 15c, the discrete signal with which the sampling hold electrical potential difference of the difference of the level of field through period 7b and the level of signal period 7c which are the reference level of the image pick-up signal 7 is obtained one by one is acquired.

[0026] The resolving power which changes an analog signal into a digital signal supplies the discrete signal acquired by the output side of this correlation duplex sampling hold circuit 15 to the analogue-to-digital conversion circuit 16 which is 10 bits.

[0027] It carries out as [ supply / the output signal of this analogue-to-digital conversion circuit 16 / to the digital picture signal output signal 19 / through the black amendment circuit 17 and

the white amendment circuit 18 ].

[0028] This black amendment circuit 17 amends dispersion in the output level at the time of the dark of the sensor section 1 of the CCD line sensor 11, is memorized in the memory which prepared the data of the output level in the condition of having turned on the shutter gate 6 in the central control unit 12, and is made to carry out black amendment by subtracting in digital one the data of the black level memorized by this memory from the data of the read signal level.

[0029] Moreover, sensibility dispersion of shading (quantity of light unevenness) of the light source and the sensor section 1 of the CCD line sensor 11 is amended, the white amendment circuit 18 is memorized in the memory which prepared the data which measured the strength of the light in the white orientation plate beforehand in the central control unit 12, and by the data of the white level memorized by this memory, division of the data of the read signal level is carried out in digital one, and it amends them.

[0030] This example is the shift register 2 of the CCD line sensor 11 like \*\*\*\*. Since it was made to perform electronic shutter actuation (actuation switched to the charge storage time from from while throwing away the charge) as were shown in drawing 3 C, and shown in the charge transfer time T at drawing 2 D and drawing 3 B The period of \*\*\*\* lead-out gate pulse  $\phi_{iROG}$  shown in a series of operating times of this CCD line sensor 11, i.e., drawing 3 A, is short made to 2700 count time amount +100 count time amount extent of a shift pulse  $\phi_1$ , and the operating time of this CCD line sensor 11 can be accelerated.

[0031] And according to this example, since it synchronizes with reset period 7a of the image pick-up signal 7, this electronic shutter actuation Even if the signal charge under charge transfer has fluctuation by this electronic shutter actuation Since this fluctuation  $\Delta V$  is removed by there being same fluctuation  $\Delta V$  in field through period 7b of the image pick-up signal 7, and signal period 7c, and carrying out a correlation duplex sampling after that, there are profits which can output a good picture signal without the effect of electronic shutter actuation.

[0032] Furthermore, in this example, since the black amendment circuit 17 and the white amendment circuit 18 are performing black amendment and white amendment after that, there are profits from which a still better picture signal is acquired.

[0033] In addition, although the above-mentioned example attached and described to the example which used the CCD line sensor, of course, you may instead be other solid state image sensor line sensors.

[0034] Moreover, as for this invention, it is needless to say that various configurations can take, without deviating from the summary of not only the above-mentioned example but this invention.

[0035]

[Effect of the Invention] While being able to carry out the high-speed operation of a series of actuation of solid state image sensor line sensors, such as a CCD line sensor, according to this invention, there are profits from which a picture signal without the bad influence of electronic shutter actuation is acquired.

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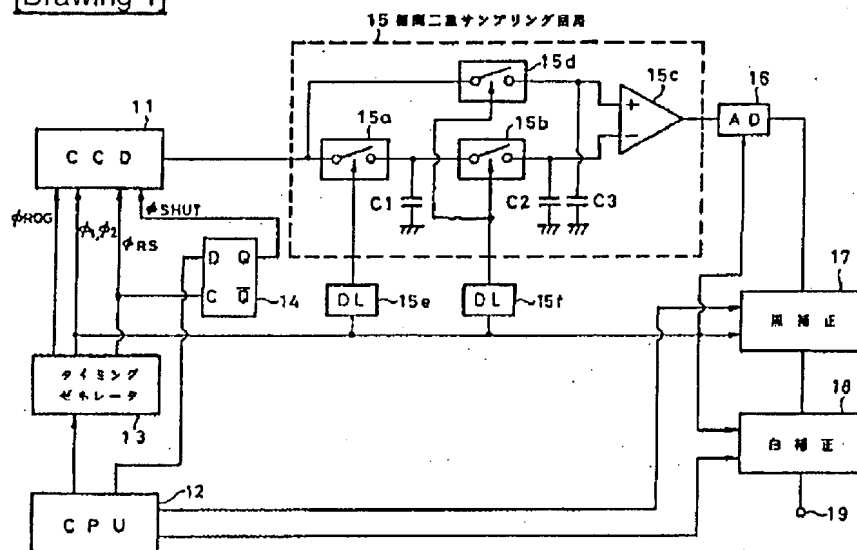
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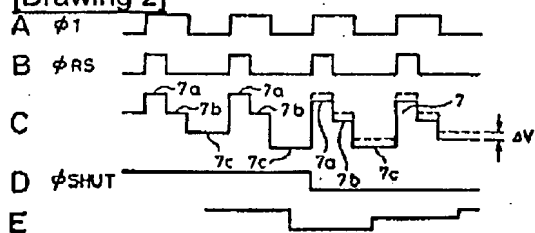
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## DRAWINGS

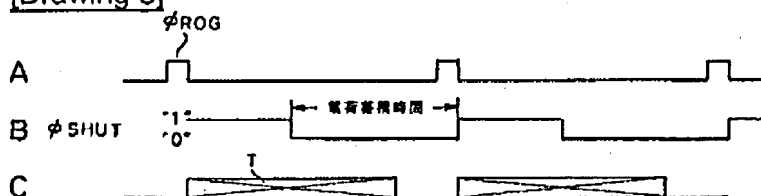
[Drawing 1]



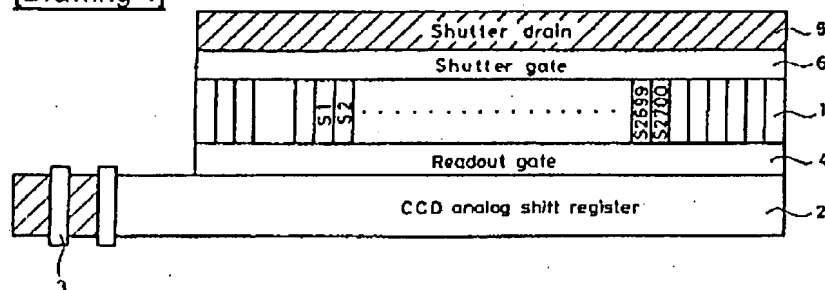
[Drawing 2]



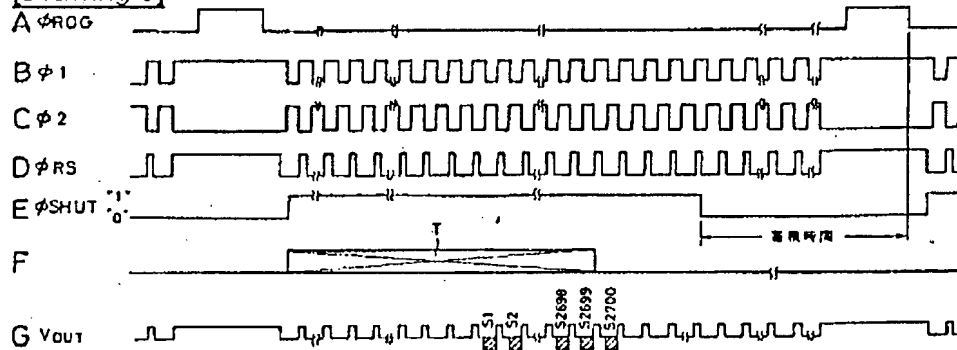
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]